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Fundamental Research

Modulation in Low Frequency Molecular Vibrations as a Possible Signature of Homoeo Medicines

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Action of homoeo potencies beyond 12th is thought to defy the laws of physics. This is because matter is not divisible and in the light of Avagodros hypothesis, no molecule of medicinal material can be present in the medicine beyond 12th potency. Hence, the question of action of homoeo potencies beyond 12th has to be addressed in a different light. Molecules of most of the solvents used for preparing homoeo potencies are hydrogen bonded. Hence, it has been proposed earlier/1/ that hydrogen bonded molecular networks along with the property of cooperative making and breaking of bonds may be responsible for preservation of information given by the starting solute to the solvent. In the present paper, we propose yet another mechanism which can be responsible for the preservation of medicinal property beyond 12th potency by discussing the experimental Raman spectra of aqueous sucrose solution.

Homoeopathic medicines are prepared by successive reduction (1:100) of the material quantities of the medicine (we will call it a solute) in a solution, with vigourous shaking at each stage/2/. This process is called potentization. The solvents generally used are water, ethyl alcohol (liquids), sucrose and lactose (solids). Beyond 12th potency(n), the presence of solute is 10^{-24} parts in 1 part of the solution. According to Avogadro's hypothesis, there are 6.03×10^{23} molecules in a gram mole of any substance. Thus, it is physically not possible to have any solute in a solution beyond this potency. And yet homoeopathic preparations are active even for n>> 1000. This fact can be translated in to the language of physics as follows:

1. A medicine can be prepared with a large number of starting materials implies that these solvents (namely water, ethyl alcohol, sucrose and lactose) can exist in a large number of states at normal temperature and pressure.

2. Potentised vehical gets the name tag of the starting medicine (solute). This means that any of these states can be obtained in a controlled way by starting with a known inducing agent called the medicine (solute).

3. The shelf life of homoeopathic medicines is very long, almost infinite, excepting in case of those prepared in water, which is a highly vulnerable fluid. This means that the states are long lived unless influenced by some external agency like temperature, pressure or interaction with other materials.

4. The fact that the properties of different medicines are different implies that the solvents used store the information which is imparted to them by starting materials.

5. The medicines "act" means that the solvent can communicate this information to a system which comes in contact with it and which is capable of interpreting this information.

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6. In human beings, the sphere of action of a medicine, that is the centres it is capable of activating, is first mapped during the process of its proving/3/. This suggests that these liquids can store a matrix of signals which are capable of activating many excitation centres of a system simultaneously or sequentially.

Sucrose and lactose are solids and therefore one can imagine that such stable states, if created, can be maintained since the relaxation times in these systems will be very long. But it is difficult for liquids like water and ethyl alcohol to store structural information over long periods of time. This is because molecules of a liquid are continuously moving and colliding with its other molecules. These liquids are known to have anomalous properties because of the interlinking of their molecules by hydrogen bonds. Earlier, we have shown that the inter molecular hydrogen bonding along with the property of cooperative making and breaking of these bonds may be responsible for carrying the information imparted to the solvent. In this communication, we show that even in liquid state, short range or medium range ordering of molecules exist which can preserve information in the form of band of intermolecular vibrational frequencies.

Atoms and molecules are always trying to move. Their motions can be broadly classified as translational, rotational and vibrational. At high temperatures, all these motions are possible but at low temperatures, translational motion is frozen and atoms/molecules can either rotate around themselves or vibrate with respect to a fixed point/ axis. In liquid state, these vibrational energies dissipate by relaxational processes. In crystalline solids, all molecules/atoms will vibrate cooperatively giving rise to what is called a vibrational mode or wave, the frequency of vibration and total number of such vibrations will be characteristic of a particular solid. If a vibration of some other frequency is induced in a solid, it will decay as a function of time. Such vibrational modes give rise to a shift in the frequency of light scattered from the sample and can be seen in Raman spectra of the sample.

In a liquid, since inter-molecular positions are not fixed, it is difficult to sustain a vibrational mode. However, now it is well accepted that over very short distances, say about a couple of nearest neighbours, such molecular orderings do occur. This gives rise to a vibrational spectrum. The advantage of being in the liquid state is that the inter-molecular distances are not fixed. This gives rise to a broad vibrational spectrum having frequencies from 10 to 150cm^{-1}. However, in the liquid state this vibrational spectrum can not be resolved and seen because of intense, broad relaxational component, as will become clear in the following text. Fortunately, low frequency Raman spectra of a glass forming liquid reveals this fact more clearly. This is because in the glassy phase, this spectrum can be easily identified because the positional ordering is again limited to a couple of nearest neighbours as in the liquid giving rise to the low frequency boson peak but the relaxational component is very weak, hence the boson peak is well resolved

Fortuitously, aqueous sucrose solutions as a function of temperature form a glassy phase as well as a liquid phase. Raman scattering spectra of aqueous sucrose solution with 85% sucrose concentration at 200K where the solutoon is in glassy phase, is seen in figure 1. At 200K, due to

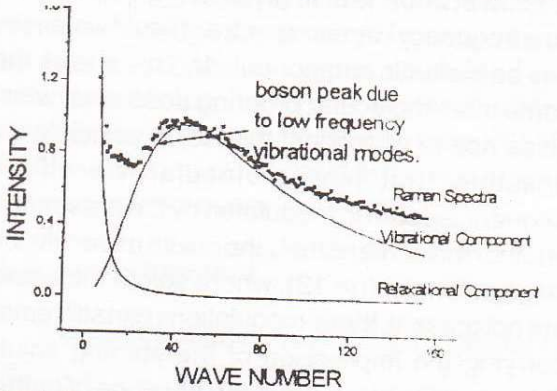

Fig. 1. Raman intensity as a function of wave number at 200K

vibrational modes a well defined inelastic peak (the boson peak) can be seen -40cm^{-1}. The central peak is very narrow due to very slow relaxational processes, thus giving a well resolved vibrational peak. The spectrum analysed in terms and vibrational and relaxational components is given in the same figure.

Aqueous sucrose solution with 85% sucrose concentration is a liquid at 353K. Raman spectrum at this temperature is seen in figure 2a. As can be seen in this figure, at this temperature, the boson peak is not visible in the experimental data. However, if the spectrum is analysed as consisting

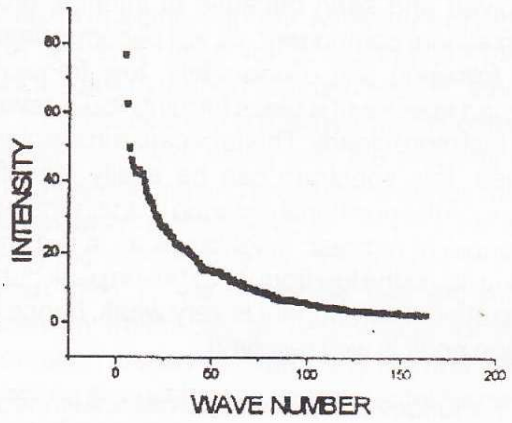

Fig. 2a. Experimental Raman spectra at 353K

of relaxational and vibrational components, vibrational part of the spectrum can be distinctly seen, as shown in figure 2b. For comparison, spectra at 200K is also given in the same figure. Low frequency Raman spectra of liquid water also has an inelastic component /4/. This shows that some inter-molecular ordering does exist which gives rise to vibrational modes. In principle it is possible that inter-molecular vibrational frequencies can be modulated by the presence of another molecule namely the solute molecule. For large potencies(n> 12), where solute molecules are not present, these modulations can still remain carrying the impression of the starting solute. Thus, in principle, even in the absence of matter, a signature of the material in the form of modulation

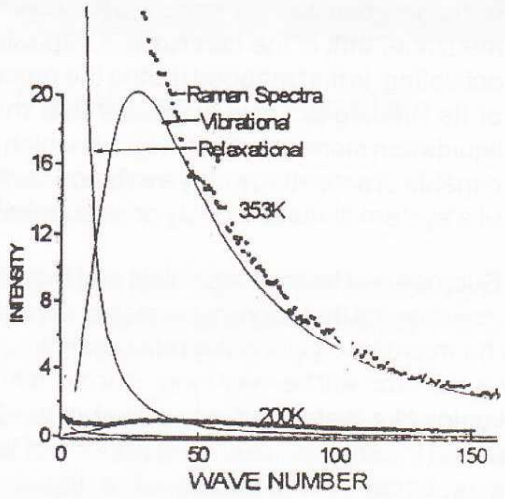

Fig. 2b. Vibrational and relaxational contributions to the total spectra at 353K and 200K

in inter-molecular vibrational frequencies can be stored. This is one of the possible ways in which homoeo potencies can retain the memory of solute molecule in the form of a signature.

Extensive literature /5/ is available on water as it is fluid which interests scientists in diverse fields such as in physics, chemistry and in biology. The picture about the nature of water evolved on the basis of available experimental evidence and theories which attempt to explain the water anomalies is as follows:

(a) In liquid water, molecules are linked together forming multimers, with clusters of hundreds of molecules being possible/6/. It is possible to have infinite structural variations of water resonating between each other/7/.

(b) The structure of water is strongly affected by the presence of small amounts of solutes /8/. In biological systems, where water exists as a vicinal fluid, its structure depends upon its site /9/. In these systems, water plays an active role in transmission of signals.

(c) Frank and Wen /8/ have postulated that formation of bonds in liquid water is

predominantly a cooperative phenomenon so that in most cases, when one bond forms, several others will form and when one bond breaks, typically a whole cluster will dissolve.

In the light of the above facts, we can suggest the following picture for the potentized solvent:

1. When the medicinal substance is present in material quantity, the effect of first few potentizations is to homogeneously disperse the solute.

2. At sufficiently low dilution one can assume that the solute particles are far apart from each other. The solvent around these monodispersed solute units gets structured with vibrational modes commensuarate with the presence of solute.

3. The vibrational spectra of the solvent which is in between two such units is also modulated to suitably account for the solute present.

4. Further potentization decreases the material quantity of the medicine. While potentizing, the energy supplied by the strokes stimulates the solvent system to acquire the structure compatible with that of a drop of the previous potency.

5. The physical properties of the solvent like melting and boiling points, IR, UV absorption spectra, NMR spectra, remain unalterd (for a potency, n>12) /10/. This suggests that the information imparted by the starting solute during potentization is within the error bars of the original configeration of water. In other words, the information might be stored as the difference in the bond energies.

6. Like any other liquid, water is a fluid. Hence, molecules continuously move about and collide with each other. During these collisions, inter-molecular bonds will be continuously making and breaking. However, the properties of a potency remain unchanged, thus suggesting that the mechanism of cooperative making and breaking of bonds /8/ may be extended to imply the preservation of the embedded liquid structures.

Now let us visualise how the potencies act. When this potentized solvent comes in contact with any other system, its states will equilibrate with the states of the interacting system. The host system can be living or non-living. For instance, a drop of n^{th} potency of a medicine when put in pure distilled alcohol, can transfer the, information to the later, thus creating $(n+1)^{th}$ potency. In a biological system, the potentized solvent equiliberates with the fluids in the bio-system. If the signals imposed by the potentized solvent are comparable to the excitation energies of the host's contral system centres /11/, it will be absorbed, thus activating the control system.

In higher forms of life, the action of the medicines can be thought of as analogous to the action of an infecting bacteria or a virus. As soon as the signals are absorbed by the organism, the defence mechanism, taking it as an external invasion, starts fighting against it thus initiating the curing process with or without perceptible aggravation.

We have attempted to give a plausible explanation to the formation of homo eo potencies. It is essential to conduct experiments to demonstrate unequivocally that homoeo potencies are a reality and they act on biological systems. Although physical experiments may not be able to decode the signal embedded in a homoeo potency, biological systems offer a versatile tool for experiments with them /12,13/. Further experiments to unravel the mysteries of homoeo potencies are under way.

Acknowledgement

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References

/1/ A.S. Paranjpe, an article presented at the first symposium of the Association for Research in Homoeopathy (1987). Also published in *Quarterly Bulletin of the Central Council for Research in Homoeopathy* 10, 26 (1989).

/2/ Wiliam Boericke, *Organon of medicine, sixth edition*. Samuel Hahnemann. Jain Publishers, Delhi, reprinted (1979). § 269 to 271.

/3/ Wiliam Boericke, *Organon of medicine, sixth edition*. Samuel Hahnemann. Jain Publishers, Delhi, reprinted (1979). §105 to 142.

/4/ Ole F. Nielsen, *Chem. Phys. Letters* **60**, 515 (1979).

/5/ H. S. Franks, *Water a comprehensive treatise*, vol. 1 to 7, Plenum press, New York.

/6/ G. Nemethy and H.A. Scheraga, *J. Chem. Phys.* **36**, 3382 (1962).

/7/ F.H. Stillinger and T.A. Weber, *J. Phys. Chem.* **87**,2833 (1983).

/8/ H.S. Franks and W.Y. Wen, *Disc. Faraday Society* **24**, 133 (1957).

/9/ K.H. Mild and S. Lovtrup, *Biochemica et Biophysica Acta* **822**, 155 (1985).

/10/ We have conducted these experiments for n=15 and could not detect any differences within our experimental limits.

/11/ P.H. Oosting, *Reports on progresses in Physics* **42**, 1479 (1979).

/12/ G.D. Jindal, A.S. Paranjpe, H. Singh, C.S. Subbanna, J.P. Babu, A.K. Deshpande and J.P. Goyal, *Proceedings of the national symposium cum workshop on advances in imaging and image processing and XII all India convention of Biomedical and Bioengineering Socity of India*, S-IV, 91.

/13/ A.S. Paranjpe and S.P. Kale, *Indian Journal of Homoeopathy* **32**, 63(1997).